CORE
Metadata, citation and similar papers at core.ac.uk
Provided by IDS OpenDocs

The Central African Journal of Medicine

Supplementary Issue to 1992 Volume 38,
1991 University of Zimbabwe Annual Research Day

THE CENTRAL AFRICAN
JOURNAL OF MEDICINE

Vol. 38, No. 7, July 1992

The immunoglobulin levels in infants attending a routine health clinic at Mbare Polyclinic

ZAR GOMO, D SIKUNA

SUMMARY

This study establishes the reference ranges for immunoglobulins in health infants attending a City Heath Polyclinic. There were sex differences in the immunoglobulin level ($p<0,05$). A wide range of immunoglobulins concentrations were apparent. This was consistent with other reports. In addition, an age dependency in the immunoglobulin levels was also observed. This study is constituted in the understanding of immunoglobinopathology.

INTRODUCTION

Paediatric biochemical parameters differ from adult and geriatric biochemical parameters. This age difference in several laboratory tests necessitates the determination of reference at different age groups. Immunoglobulin (Ig) levels are assessed in infants in particular those children who have experienced several episodes of infectious illness.

For the evaluation of hypogammaglobinaemia in infants, there ought to be reference ranges with which the child's values may be compared. Apart from infectious diseases, serum Ig levels are affected by ethinicity,[1-9] age,[10-17] sex,[18] socio-economic and nutritional status, exposure to antigenic stimuli and genetic make up.[19]

Serum Ig values for infants of less than one year are not as yet available in Zimbabwe, hence the need for local reference value. Serum IgA and IgM levels are lower in the first month while IgG is higher at birth reflecting transplacental transfer of maternal IgG. There is a fall in IgG concentration in the first three moths accentuated by the increase in the blood volume of the growing infant. There is an inability to synthesize IgG rapidly enough to prevent the fall due to catabolism of maternal IgG. Thereafter, the rate of synthesis overtakes the rate of breakdown of maternal IgG and the overall concentration increases steadily.

The other immunoglobulins, i.e. IgM and IgA do not cross the placenta and low but significant levels of IgM in cord blood may reflect fetal infections. IgM reaches adult levels by ninth month.

The purpose of this study was to investigate immunoglobulins levels in neonates and infants attending a health baby clinic at Mbare Polyclinic. This information could be of importance in evaluating infections.

MATERIALS AND METHODS

One hundred infants less than 13 months of age who made a visit to Mbare between 2nd May 1989 and July 1989 were included in this study. This clinic was chosen because the enrollers demonstrated good compliance with good child care. The clinic services a population of about one hundred thousand per year. The objectives of the study were fully explained to the parents.

Each infant underwent a physical examination and the card, Road to Health, was studied before peripheral venous blood was collected. The participation was on the mother's consent. The amount of blood collected from each subject was two ml.

ZAR Gomo
Department of Chemical Pathology
University of Zimbabwe
Medical School
P.O Box A178
Harare

Table I: Comparison of serum IgG (mg/dl) levels in male and female infants aged between 0–13 months. IgG levels being higher in female infants than male infants.

AGE IN MONTHS	SEX	n	MEAN	SD	RANGE
0	Male	14	1154,71	281,73	872,98– 1436.44
	Female	7	1112,71	226,52	886.19–13339.23
P valve			>0,05		
1≤4	Male	6	576.17	206.16	370.01– 782.33
	Female	12	971.67	497.37	474.30–1469.04
P valve			<0,05		
5≥7	Male	13	798,77	315,68	483,14–1114,40
	Female	7	1090,86	1118,84	–27,98–2209,70
P			>0,05		
8≤10	Male	10	967,70	270,62	967,08–1238,32
	Female	10	1004,60	492,38	512,22–1496,98
P			>0,05		
11–13	Male	6	1139,83	677,21	462,62–1817,04
	Female	15	1240,60	563,10	677,50–1803,70
P			>0,05		

Table II: Comparison of serum IgA levels (mg/dl) between male and female infants aged 0–13 months.

AGE IN MONTHS	SEX	n	MEAN	SD
0	Male	14	42,06	6,14
	Female	7	40,00	0,0
P			>0,05	
1<4	Male	6	44,13	5.55
	Female	12	45,23	7,66
P			>0,05	
5<7	Male	13	51,65	20,72
	Female	7	46,51	7,88
P			>0,05	
8<10	Male	10	61,67	22,68
	Female	10	56,68	21,26
P			>0,05	
11<13	Male	6	63,25	24,02
	Female	15	61,33	20,58
P			>0,05	

Table III: Summary of serum IgM levels (mg/dl) in male and female infants aged between 0–13 months, IgM levels being higher in female infants p<0,05.

AGE IN MONTHS	SEX	n	MEAN	SD		RANGE
0	Male	14	14,51	10,73	33,78	55,24
	Female	7	52.23	28,74	23.74	80,97
P			>0,05			
1<4	Male	6	71,37	32,25	39,12	103.62
	Female	12	102,08	55,67	46,41	157,75
P			>0,05			
5<7	Male	13	63,63	25,38	38,25	89,01
	Female	7	155,04	91,57	63,47	246,61
P			>0,05			
8–10	Male	10	97,69	47,68	50,01	145,37
	Female	10	117,17	33,47	83,70	150,64
P			>0,05			
11–13	Male	6	124,87	60,36	64,51	185,23
	Female	15	151,47	52,79	98,68	204,26
P			>0,05			

Table IV: Comparison of several Serum Immunoglobulin levels (Mg/dl) in infants Aged 0–13 months from different countries. A wide range of Immunoglobulin levels was apparent.

AUTHOR	PARENT POPULATION	AGE	IgG mg/dl MEAN	IgG mg/dl RANGE	IgG mg/dl MEAN	IgG mg/dl RANGE	IgG mg/dl MEAN	IgG mg/dl RANGE
Sulman and Gilich	South African Black infants	1–12 weeks	732	378–1 399	54	16–179	116	41–329
Present Series	Mbare	new born	1140,71	881,1–1400	41,38	36,33–46	7,08	28–65
Heese, H De V *et al*	Namibian	1–4	711	482–1148	35	16–68	87	55–150
Present Series	Mbare infants	1–4	839,83	382–1297	44.86	37–51	91	41–142
Shulman and Gilich	South African infants	6–9	836	442–1 584	64	24–169	125	58–270
Allan Smith *et al*	N American	5–8	433	250–119 0	34	10–87	60	14–167
Heese, H De V *et al*	Namibian infants	4–8	816	522–1 309	50	26–93	105	61–72
Present Series	Mbare infants	5–7	90,1	209–1592	491	474–509	95	24–166
Sulman and Gilich	South African infants	9–12	852	490–1495	80	337–172	138	76–248
Allan Smith	N American	9–14	633	322–1245	40	17–94	80	29–216
Heese, H De V *et al*	Namibian infants	8–12½	1 015	680–1490	61	35–111	111	71–196
Present Series	Mbare infants	10–13	1 211	629–1790	61	40–82	143	88–198

Of the 100 participants, 21 were newborns, 18 were infants from one to three months, 20 were up to six months, 20 were up to nine months and 21 were from 10 to 13 months old. The subjects recruited consisted of 49 males and 51 females.

After collection of blood, the specimens were transported to the laboratory. On arrival, the serum was stored at a temperature of –20°C until the time of estimation.

IgA, IgG levels were determined using a Beckman ICS nephelometer (Beckman ICS analyser II with diluter and dispenser, immunochemical instrument). The statistical analysis employed was the T-test, by SPSS/PC and the statistical package for IBM PC.

RESULTS

Tables I, II, and III compare IgG, IgA and IgM serum levels between sexes at a given age.

IgG was slightly higher in female than in male infants ($p<0,05$, Table I). The same trend was true of IgM, i.e. higher IgM values being found in the female group (0,05, Table III). Table II shows a different trend. The serum values of IgA were higher in male infants than in female infants ($p<0,05$). Table IV is a comparison of results from this study with other published results. Wide ranges of immunoglobulins classes studied were apparent in all groups studied. Mbare Polyclinic immunoglobulin results were similar to other published results (Table IV).

Figures 1, 2 and 3 illustrate the age dependence of IgG, IgA and IgM. These curves are consistent with expected trends of the immunoglobulins.

DISCUSSION

This study established serum immunoglobulin ranges of infants at a City Council Polyclinic. Normal ranges by and large are sex, age and ethnic group dependent. This suggests that one cannot necessarily use values obtained in populations which are not similar to the population in study.

Previous work has shown low levels of IgA and IgM in the first month of life.[15] Findings in this study are consistent with this view. The low levels being explained by the fact that IgA and IgM are not maternally transferable to the fetus. Thus synthesis of IgA and IgM starts after birth.

A significant sex difference ($p<0,05$) was found in the IgG and IgM results. These results confirm Shulman *et al*[21] results which indicated a significant higher IgM in female infants than males. Higher IgM in older female infants aged four to seven years has also been reported.[14,24]

A positive increase in IgA and IgM is consistent with the view that these immunoglobulins increase in

Figure 1: Serum IgG concentrations at different age groups. A fall in serum IgG concentrations within three months of birth was illustrated. Thereafter, serum IgG increased with age.

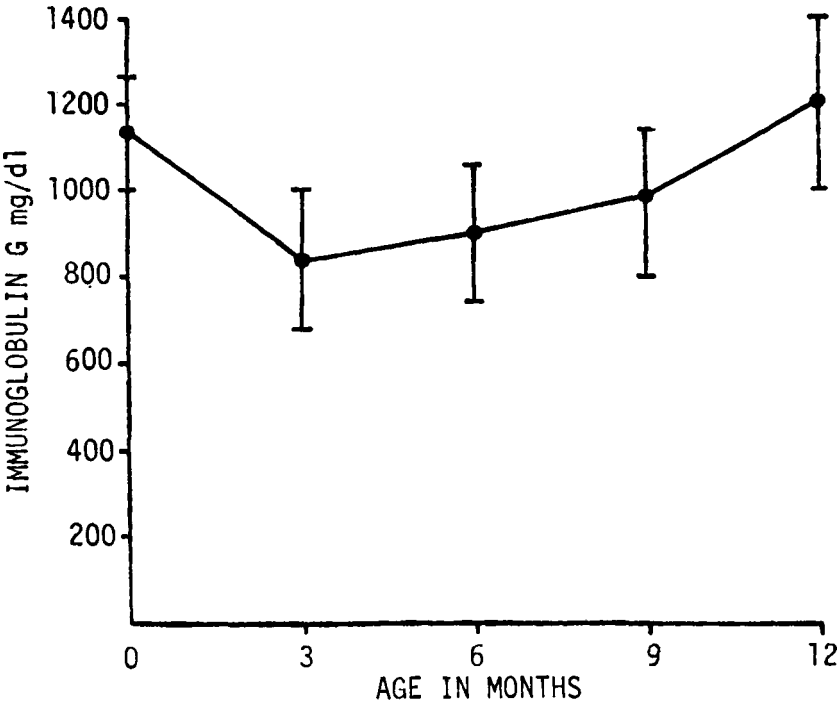


Figure 2: Serum IgGA levels at different age groups. An increase in IgGG levels with age was demonstrated.

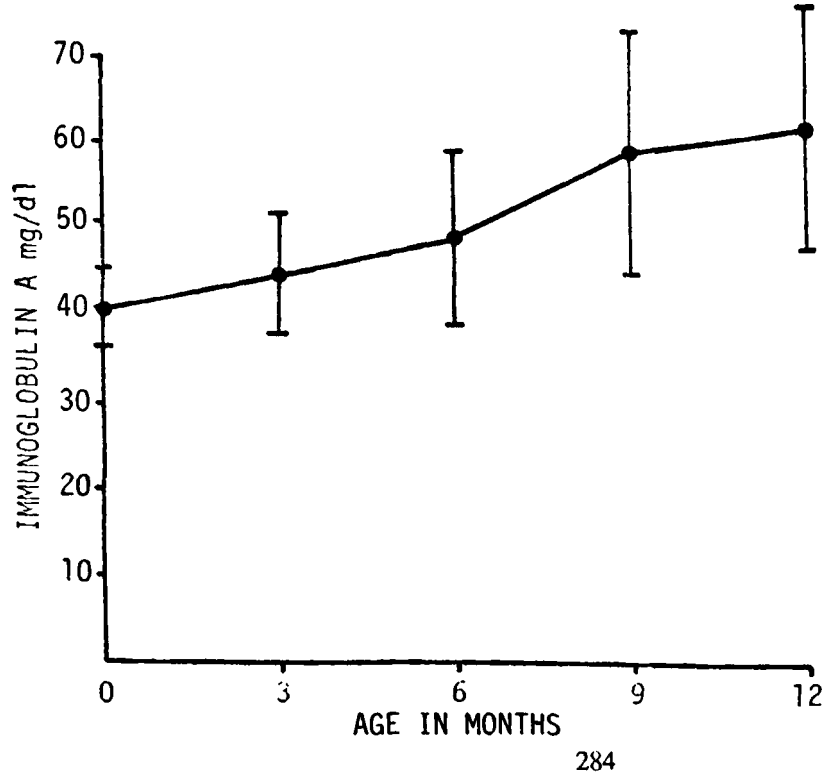
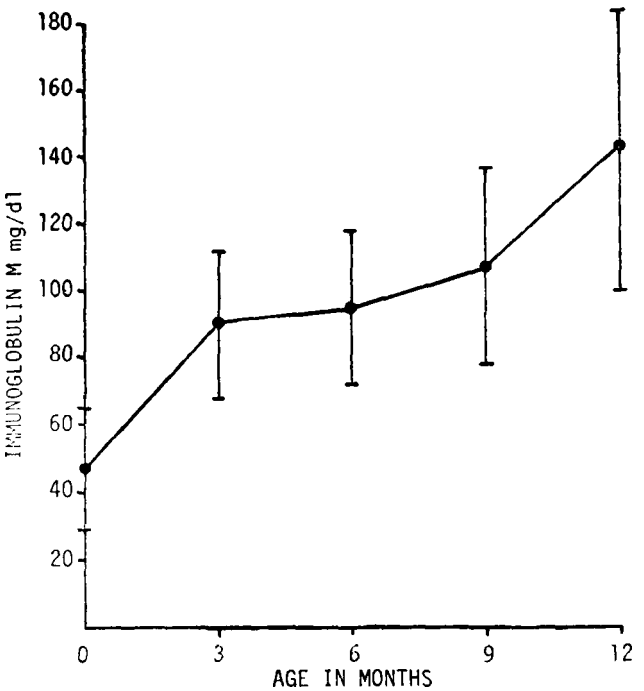


Figure 3: Illustrates serum IgM concentrations with age. An increase in serum IgM concentrations with increase in age was observed.



concentration with age until year of maximum production. This trend was observed in this study.

ACKNOWLEDGEMENTS

The authors would like to thank Dr Chidoori for her help in selecting participants, the University of Zimbabwe for funding the study, the City Health Department for permission to carry out the study at Mbare Polyclinic and Miss C Ngondo for typing the paper.

This study has established ranges for Ig levels in infants less than 12 months old. The information would be useful when considering immunodeficiency problems in the infants.

REFERENCES

1. Buckley CE, Dorsey FC. Serum Immunoglobulin levels throughout the life-span of healthy man. *Ann Intern Med* 1971; 672–82.
2. Arens L, Brock JF. Some aspects of the serum protein patterns of Africans. *A Afr J Clini Sci* 1954; 5:20–34.
3. Holmes EG, Stanier MW, Thompson MD. The serum protein pattern of Africans in Uganda: Relation to diet and Malaria. *Trans Roy Soc Trop Med Hyg* 1955; 49:376–84.
4. Gilles HM, McGregor IA. Studies on the significance of high serum gama globulin concentrations in Gambian Africans III. Gama globulin concentrations of Gambian women protected from malaria for two years. *Ann Trop Med Parasitol* 1961; 55:463–7.
5. Kalff MW. A population study on serum immunoglobulin levels. *Clin Chim Acta* 1970; 28:277–89.
6. Shulman G, Gilich GC, Andrew MJA. Serum immunoglobulins G, A and M in White and Black adults on the Witwatersrand. *S Afr Med J* 1975; 49:1 160–4.
7. Milner LV, Calitz F. Serum immunoglobulin levels in White, Asiatic and Bantu blood donors. *S Afr Med J* 1971; 45:683–5.
8. Roode H. Serum Immunoglobulin values in White and Black South African pre-school children, Part I Health children. *J Trop Pediatr* 1980; 104–7.

9. Roode H. Serum Immunoglobulin values in White and Black pre-school South African children. Part II: Children with respiratory infections *J Trop Pediatr* 1980; 26:108–13.
10. West CD, Hong R. Holland NH. Immunoglobulin levels from the new born period to adulthood and immunoglobulin deficiency states. J Clini Invest 1962; 41: 2054–64.
11. Steihm ER, Fudenberg HH. Serum levels of human immune globulin in health and disease. A survey. *Pediatrics* 1966; 715–27.
12. Collins-Williams C, Toft B, Generoso L, Moscarellom. Quantitative immunoglobulin levels (IgG, IgA and IgM) in children. Determined by Hyland Immunoplate Technique. *Can Med Ass J* 1967; 99:1510–13.
13. Gitliu D. The differentiation and motivation of specific immune mechanisms. *Acta Paediatr Scand* 1971; Suppl 172:60–74.
14. Allan Smith M, McClellan BH, Butterworth M, Maloney JR. Development of immunoglobulin levels in man. *J Pediatr* 1968; 276–90.
15. Berg T. The immunoglobulin development during the first year of life. *Acta Paediatr Scand* 1969; 58:229–36.
16. Uffelman IA,England WE, Joliff CR. Quantitation of immunoglobulins in normal children. *Clin C Acta* 1970; 28:185–92.
17. Chandra RK, Ghai OP. Serum immunoglobulins in healthy children from birth to adolescence. *Indian J Med Res* 1972; 60:89–96.
18. Golubjatiikov R, Steadman M. Serum levels of immunoglobulins in Mexican pre-school children. *Am J Epidemiol* 1972; 95:542–8.
19. Sehgals, Aikat BK. Serum immunoglobulins in healthy Indians. *Indian J Med Res* 1970; 58:289–96.
20. Buckley RH, Dees SC, O'Fallon WM. Serum immunoglobulins I. Levels in normal children and in the uncomplicated childhood allergy. *Paediatrics* 1965; 41:600–11.
21. Shulman G, Gilich GC. Serum immunoglobulins in black South African children. *S Afr Med J* 1976; 50:1465–7.
22. Super M, Heese H de V, McKenzie D, Dempster WS, du Plessis JME, Ferreira JJ. An epidemiological study of well wates Uifrites in a group of South West Africa/Namibian infants. *Wate Res* 1981; 15:1265–70.
23. Zeger BJM, Van Der Giesseb M, Reeriuk — Brougers EE, Stoop JW. The serum Igg sub class levels in healthy infants of 13–62 weeks of age. *Cli Chem Acta* 1980; 101:265–9.
24. Maddisouse, Reimer CB. Normative values of serum immunoglobulins by single radial immuno-diffusion: *A Review Clin Chem* 1976; 594–601.
25. Heese H de V, du Plessis JME, Penipste WS, McKenzie D and Super M. Serum IgG, IgM levels in rural Namibian infants. *J of Tropical Pediatrics* 1985; 31:48–54.
26. Fosarelli P, Winkelsstein J, De Augelis C, David Mellits ED. Serum immunoglobulins in the first year of life. *Clin Pediatr* 1985; 24 (2):84–88.

This work is licensed under a
Creative Commons
Attribution – NonCommercial - NoDerivs 3.0 License.

To view a copy of the license please see:
http://creativecommons.org/licenses/by-nc-nd/3.0/

This is a download from the BLDS Digital Library on OpenDocs
http://opendocs.ids.ac.uk/opendocs/

Institute of Development Studies